

# **IE 410 – INTRODUCTION TO ROBOTICS**

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## **Lab-8 report**

### **Turtlebot3 and simulation**

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- **Installing turtlebot3**

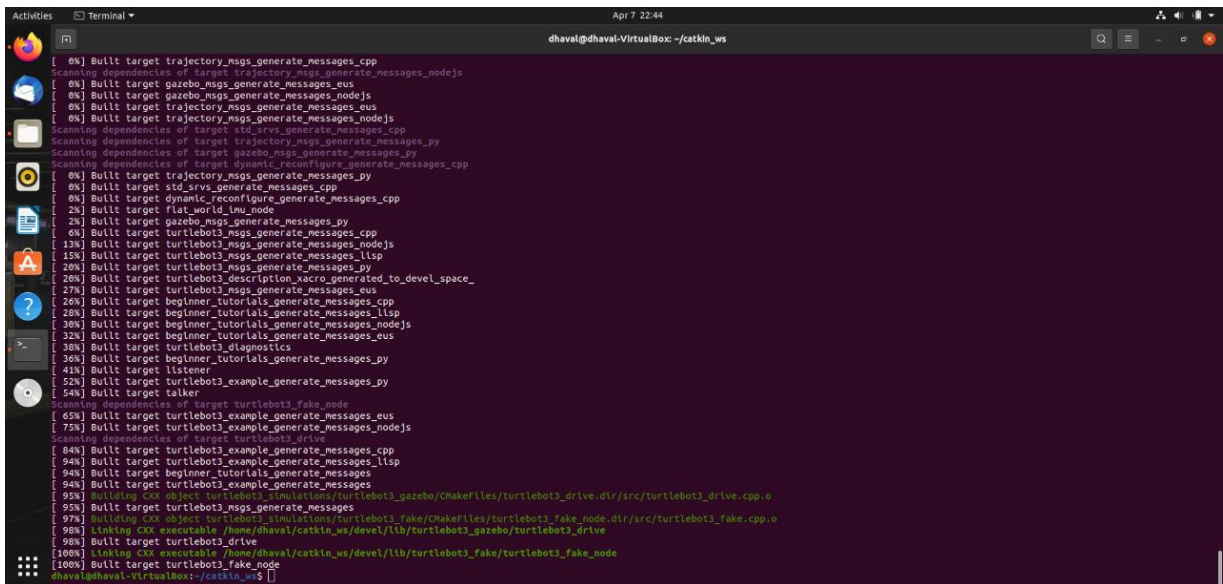
Run following commands to install turtlebot3

```
$ cd ~/catkin_ws/src/  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_msgs.git  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3.git  
$ cd ~/catkin_ws && catkin_make
```

After, add following line in our .bashrc file export  
TURTLEBOT3\_MODEL=burger

Now run the following commands

```
$ source ~/.bashrc  
$ cd ~/catkin_ws/src/  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_simulations.git  
$ cd ~/catkin_ws && catkin_make
```



```
Activities Terminal Apr 7 22:44  
dhaival@dhaval-VirtualBox: ~/catkin_ws  
[ 0%] Built target trajectory_msgs_generate_messages_cpp  
Scanning dependencies of target trajectory_msgs_generate_messages_nodejs  
[ 0%] Built target gazebo_msgs_generate_messages_eus  
[ 0%] Built target gazebo_msgs_generate_messages_nodejs  
[ 0%] Built target trajectory_msgs_generate_messages_eus  
[ 0%] Built target trajectory_msgs_generate_messages_nodejs  
Scanning dependencies of target std_srvs_generate_messages_cpp  
Scanning dependencies of target trajectory_msgs_generate_messages_py  
Scanning dependencies of target gazebo_msgs_generate_messages_py  
Scanning dependencies of target dynamic_reconfigure_generate_messages_cpp  
[ 0%] Built target trajectory_msgs_generate_messages_py  
[ 0%] Built target std_srvs_generate_messages_cpp  
[ 0%] Built target dynamic_reconfigure_generate_messages_cpp  
[ 2%] Built target rqt_world_lmw_node  
[ 2%] Built target gazebo_msgs_generate_messages_py  
[ 0%] Built target turtlebot3_msgs_generate_messages_cpp  
[ 1%] Built target turtlebot3_msgs_generate_messages_nodejs  
[ 15%] Built target turtlebot3_msgs_generate_messages_lisp  
[ 20%] Built target turtlebot3_msgs_generate_messages_py  
[ 20%] Built target turtlebot3_description_xacro_generated_to_devel_space_  
[ 27%] Built target turtlebot3_msgs_generate_messages_eus  
[ 26%] Built target beginner_tutorials_generate_messages_cpp  
[ 20%] Built target beginner_tutorials_generate_messages_lisp  
[ 30%] Built target beginner_tutorials_generate_messages_nodejs  
[ 32%] Built target beginner_tutorials_generate_messages_eus  
[ 38%] Built target turtlebot3_diagnostics  
[ 36%] Built target beginner_tutorials_generate_messages_py  
[ 41%] Built target listener  
[ 52%] Built target turtlebot3_example_generate_messages_py  
[ 54%] Built target talker  
Scanning dependencies of target turtlebot3_fake_node  
[ 65%] Built target turtlebot3_example_generate_messages_eus  
[ 75%] Built target turtlebot3_example_generate_messages_nodejs  
Scanning dependencies of target turtlebot3_drive  
[ 84%] Built target turtlebot3_example_generate_messages_cpp  
[ 94%] Built target turtlebot3_example_generate_messages_lisp  
[ 94%] Built target beginner_tutorials_generate_messages  
[ 94%] Built target turtlebot3_example_generate_messages  
[ 95%] Building CXX object turtlebot3_simulations/turtlebot3_gazebo/CMakeFiles/turtlebot3_drive.dir/src/turtlebot3_drive.cpp.o  
[ 97%] Linking CXX object turtlebot3_simulations/turtlebot3_fake/CMakeFiles/turtlebot3_fake_node.dir/src/turtlebot3_fake.cpp.o  
[ 98%] Linking CXX executable /home/dhaival/catkin_ws/devel/lib/turtlebot3_gazebo/turtlebot3_drive  
[ 98%] Built target turtlebot3_drive  
[ 100%] Linking CXX executable /home/dhaival/catkin_ws/devel/lib/turtlebot3_fake/turtlebot3_fake_node  
[ 100%] Built target turtlebot3_fake_node  
dhaival@dhaval-VirtualBox:~/catkin_ws
```

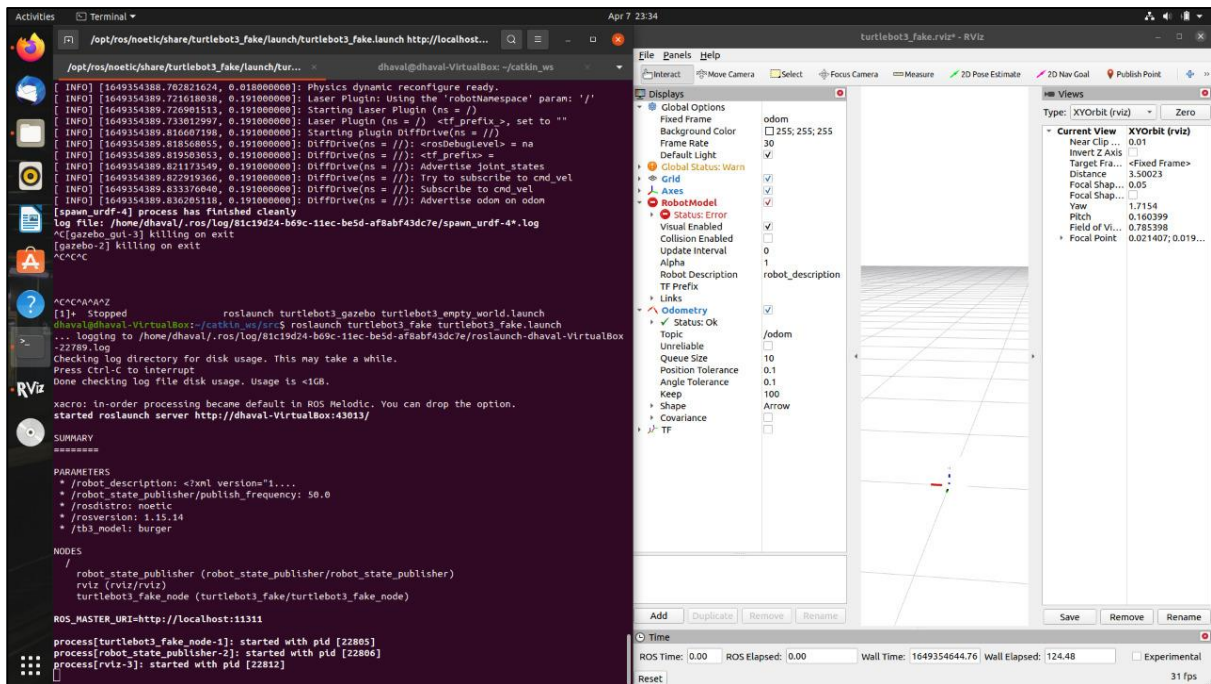
- Simulate turtlebot3 using RViz

Run the following command to simulate turtlebot3 using RViz.

```
$ roslaunch turtlebot3_fake turtlebot3_fake.launch
```

If you want to control turtlebot3 using your keyboard run the following command.

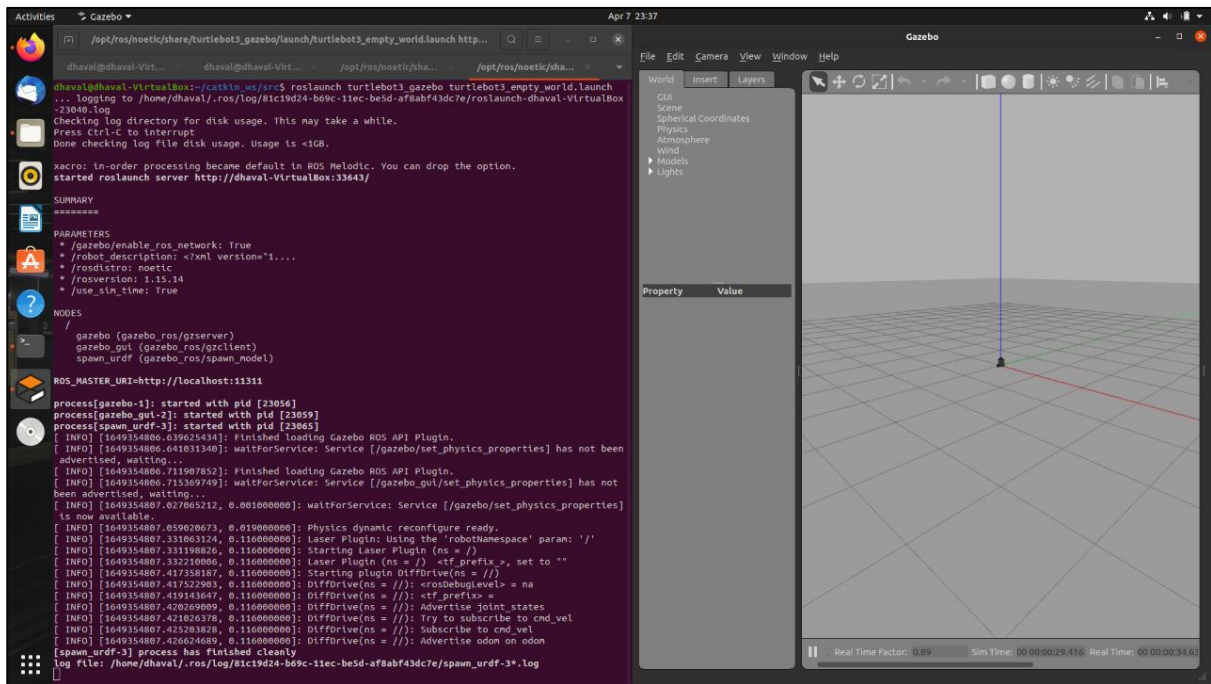
```
$ roslaunch turtlebot3_teleop turtlebot3_teleop_key.launch
```



- **Simulate turtlebot3 using Gazebo**

Run the following command to simulate turtlebot3 using Gazebo.

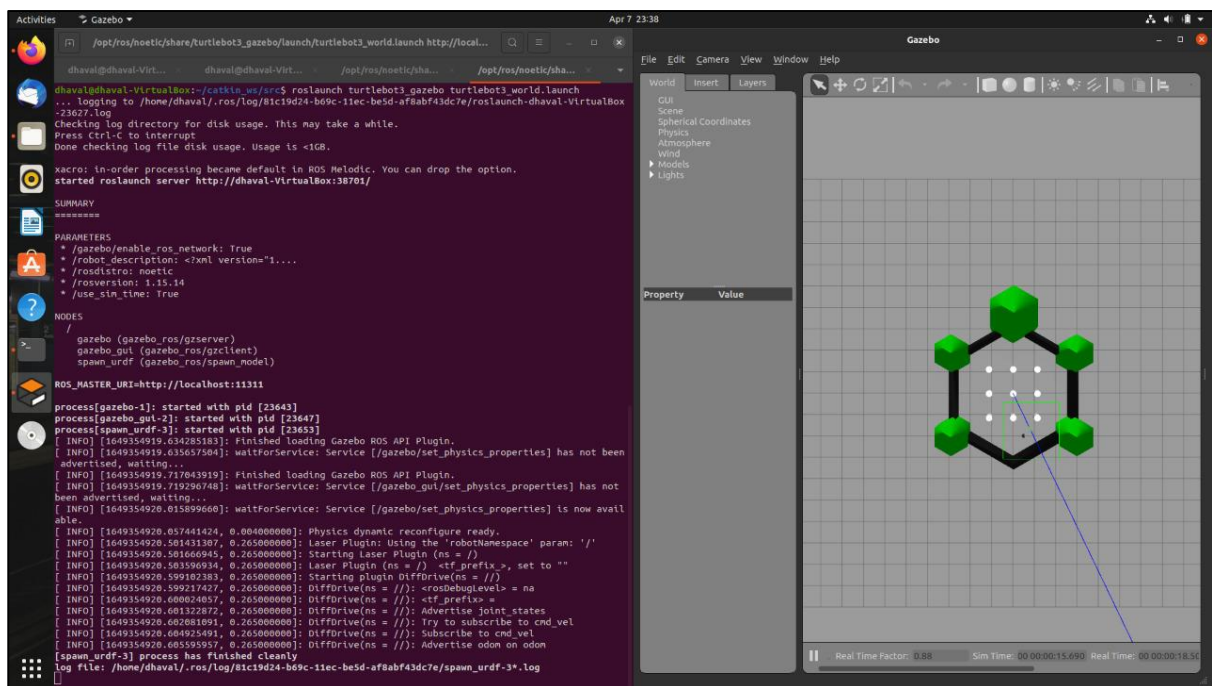
```
$ roslaunch turtlebot3_gazebo turtlebot3_empty_world.launch
```



- **Managing simulation environment of turtlebot3**

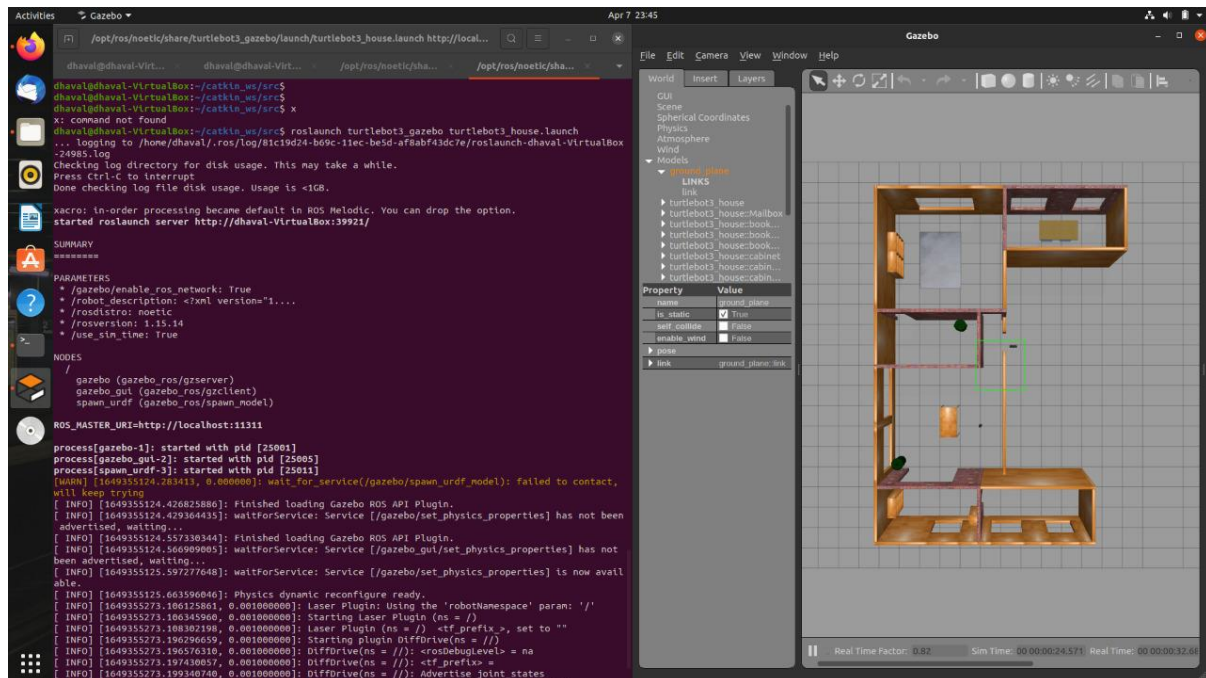
Let's look at our turtlebot3 in a different environment. This environment is often used for testing SLAM and navigation algorithms. Simultaneous localization and mapping (SLAM) concerns the problem of a robot building or updating a map of an unknown environment while simultaneously keeping track of its location in that environment.

```
$ roslaunch turtlebot3_gazebo turtlebot3_world.launch
```



Type this command and wait a few minutes for the environment to load to stimulate turtlebot3 inside a house.

```
$ roslaunch turtlebot3_gazebo turtlebot3_house.launch
```



To move the turtlebot with your keyboard, use this command in another terminal tab:

```
$ roslaunch turtlebot3_teleop turtlebot3_teleop_key.launch
```



- **Simulating SLAM with TurtleBot3**

Install the SLAM module in a new terminal window.

```
$ sudo apt install ros-melodic-slam-gmapping
```

```
$ roslaunch turtlebot3_gazebo turtlebot3_world.launch
```

```
$ roslaunch turtlebot3_slam turtlebot3_slam.launch  
slam_methods:=gmapping
```

```
$ roslaunch turtlebot3_gazebo turtlebot3_simulation.launch
```

